

CLAIMS

I claim:

1                   1.       A method for the reduction of load cycle oscillations in the drive train of a  
2 motor vehicle, the method comprising:

3                   detecting a change in an available torque in the drive train of a motor vehicle, said  
4 change causing a load cycle oscillation having a period,

5                   determining the period of the load cycle oscillation, and

6                   at the commencement of the change in available torque, applying at least one  
7 torque pulse which causes an oscillation in phase opposition to the load cycle oscillation, said  
8 torque pulse having a duration which is about half the period of the load cycle oscillation.

1                   2.       A method as in claim 1 further comprising detecting the magnitude of the  
2 available torque, said torque pulse having a magnitude which is about half the magnitude of the  
3 available torque.

1                   3.       A method as in claim 1 wherein said torque pulse is triggered by a logic  
2 device.

1                   4.       A method as in claim 1 wherein said torque pulse is applied by an electric  
2 motor.

1                   5.       A method as in claim 1 wherein said torque pulse is applied by a starter  
2 motor of the vehicle.

1           6.       A method as in claim 1 wherein said torque pulse is applied by a rotating  
2 mass via a brake.

1           7.       A method as in claim 1 wherein said torque pulse is controlled by torque  
2 information from engine electronics.

1           8.       A method as in claim 1 further comprising determining a change in  
2 rotational speed, and deriving control of the torque pulse from the change in rotational speed.

1           9.       A method as in claim 1 wherein said torque pulse is applied to the engine  
2 of the motor vehicle.

1           10.      A method as in claim 1 wherein said drive train comprises a flywheel  
2 having a primary part and a secondary part, said torque pulse being applied to one of said  
3 primary part and said secondary part.

1           11.      A method as in claim 1 comprising applying a first torque pulse having a  
2 negative value with respect to said available torque, and applying a second torque pulse having a  
3 positive value with respect to said available torque.

1           12.      A method as in claim 1 wherein said torque pulse commences at the time  
2 of synchronization during one of a gear change and starting the engine.

1           13.      A method as in claim 1 wherein said torque pulse commences during one  
2 of a first rise in available torque and an engine torque in opposition to said available torque.

1           14.    A method as in claim 1 comprising a first torque pulse and a second torque  
2 pulse, said second torque pulse commencing one period later than commencing the first torque  
3 pulse.

1           15.    A method as in claim 1 comprising providing first, second, and third  
2 torque pulses in succession, said second torque pulse directed opposite to said first and third  
3 torque pulses.

1           16.    An apparatus for the reduction of load cycle oscillations in the drive train  
2 of a motor vehicle, the apparatus comprising:

3                   means for detecting a change in an available torque in the drive train of a motor  
4 vehicle, said change causing a load cycle oscillation having a period,

5                   means for determining the period of the load cycle oscillation,

6                   means for generating a torque pulse coupled to the drive train, and

7                   logic means for triggering the torque pulse at the commencing of a load cycle  
8 oscillation, said logic means controlling said torque pulse so that it lasts half the period of the  
9 load cycle oscillation and is in phase opposition to the load cycle oscillation.

1           17.    An apparatus as in claim 16 wherein said means for generating a torque  
2 pulse is an electric motor which is coupled to an internal combustion engine.

1           18.    An apparatus as in claim 16 wherein said drive train comprises a flywheel  
2 having a primary part and a secondary part, said means for generating a torque pulse being  
3 coupled to one of said primary part and said secondary part.

1           19.    A control program for the reduction of load cycle oscillations in the drive  
2 train of a motor vehicle, the program comprising the following program steps:

3                detecting a change in an available torque in the drive train of a motor vehicle, said  
4 change causing a load cycle oscillation having a period,

5                determining the period of the load cycle oscillation, and

6                generating a control signal for generating a torque pulse having a duration which  
7 is about half the period of the load cycle oscillation and is in phase opposition to the load cycle  
8 oscillation.

1           20.    A control program as in claim 19 wherein said program is stored on a data  
2 carrier.

1           21.    A control apparatus for the reduction of load cycle oscillations in the drive  
2 train of a motor vehicle, said control apparatus having a control program with a program <sup>code for</sup> ~~code for~~  
3 carrying out the following steps:

4                detecting a change in an available torque in the drive train of a motor vehicle, said  
5 change causing a load cycle oscillation having a period,

6                determining the period of the load cycle oscillation, and

7                at the commencement of the change in available torque, applying at least one  
8 torque pulse which causes an oscillation in phase opposition to the load cycle oscillation, said  
9 torque pulse having a duration which is about half the period of the load cycle oscillation.